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| TECHNICAL NOTE | Number | 530 |
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| **TITLE:** | FS Series and MP2500 Rechargeable Batteries |
| **ABSTRACT:** | Exchanging Rechargeable Batteries Between MP2500 and FS Series Computers. |

**Important Note:**
The FS/GS is essentially the same hardware as the FS/2. Therefore throughout this Technical Note all references to the FS/2 also apply to the FS/GS.

For the purpose of this Technical Note all references to FS Series computers includes the MP2500.

**Purpose**
The purpose of this Technical Note is to clarify the issues surrounding the difference between the rechargeable batteries used in the FS Series handheld computers.

**Details**
Itronix (UK) Ltd expends a significant amount of time and effort selecting the correct battery for use in their computers. There are three types of rechargeable batteries available for the FS Series computers, these are as follows:

| | |
|---|---|
| 1400mAh NiCad | - Use in FS/2 and FS/GS only. |
| 1600mAh NiCad | - Use in MP2500 and FS3 only. |
| 2100mAh NiMH | - Use in MP2500 and FS3 only (BIOS v1.07 or later for FS3) |
| 2700mAh NiMH | - Use in MP2500 and FS3 only (BIOS v1.07 or later for FS3) |

The FS/2 battery was selected because testing confirmed that it would provide the best all round performance. When the FS3 was designed it was clear that the electronics would have greater power requirements. The FS3 NiCad stick was selected as the most suitable available at the time. However, in response to user requests for additional battery capacity Husky sourced a NiMH alternative that improves usage times by up to 30%. The new NiMH is for use in the FS3 and MP2500 **ONLY** and the FS3 **MUST** have BIOS v1.07 (or later) fitted.

The most obvious difference in the batteries is their appearance. The FS/2 NiCad battery is currently yellow whereas the FS3 NiCad battery is currently black and the FS3 NiMH battery is predominantly green. The FS3 battery labels also state that they are for use in the FS3 and MP2500 only. (Note: Older FS3 NiCad batteries state for use in FS3 only but they are suitable for use in the MP2500).

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An FS/2 is not designed to work with the high terminal voltage that the FS3 battery exhibits during charging. An FS/2 with an FS3 NiCad fitted will exhibit intermittent problems, particularly during communications. If the FS3 NiMH is fitted to an FS/2 this will also cause unreliable operation and may physically damage the unit if the battery is charged.

The FS3 (and MP2500) requires additional capacity over that supplied by the FS/2 NiCad therefore an FS3 with an FS/2 NiCad fitted will experience difficulties during power intensive processing as the NiCad will be unable to provide sufficient power.

These power differences are best illustrated by the charging requirements as shown in the table below:

| | APM | | FPM | | SPM | |
|---|---|---|---|---|---|---|
| Computer | Fast | Maint. | Fast | Maint. | Initial | Trickle |
| FS3 or MP2500 + NiMH | 340mA | 70mA | 340mA | 70mA | 210mA | 70mA |
| FS3 or MP2500 + NiCad | 340mA (7.5hrs) | 55mA | 340mA (7.5hrs) | 55mA | 160mA | 55mA |
| FS/2 + NiCad | 340mA (6.2hrs) | 70mA | 340mA (6.2hrs) | 70mA | 120mA | 120mA |

**Note**

The charge current for FS3 and MP2500 in SPM mode drops to trickle charge after 20hours. However, this feature is only available for the FS3 if BIOS version 1.07 or later is installed. FS2 provides a constant 120mA in SPM.

MP2500 does not support APM or FPM power modes.

At the time of writing the FS3 and MP2500 BIOS provides 210mA in SPM when charging the NiMH. It is anticipated that this will be increased to 270mA to cater for the new higher capacity 2700mAh NiMH battery.

For best performance and length of service it is advisable to discharge the rechargeable batteries regularly as overcharging can reduce the length of service.

It is important to note that while APM and FPM modes on the FS/2 drop to a maintenance charge when the power level reached 100%, SPM provides a consistent level of charge for as long as the computer is connected to a mains supply. Charging will be completed after 15 hours so it is advisable to avoid regularly leaving the computer on charge for longer than 24 hours. Charging is affected by temperature and should always take place between 5C and 40C, for safety reasons charging is disabled outside these temperatures.

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## Configuring FS3 and MP2500 for use with NiMH Batteries

All MP2500 BIOS versions support NiMH batteries. However, FS3 must have BIOS v1.07 installed before NiMH batteries can be used (note: no hardware changes are necessary).

With the correct BIOS installed it is necessary to configure the FS3 for the type of battery to be used (default = NiCad). To configure the battery type the 'NON-VOLATILE CONFIGURATION' must be accessed via the UTIL program and the correct battery type must be selected.

The default charging parameters for the FS3 have also changed for BIOS v1.07, Charging defaults are as follows:

| Description | BIOS v1.06 | BIOS v1.07 |
|---|---|---|
| Power Mode | APM | SPM |
| APM % Remaining | 100 | 100 |
| APM low power threshold | 5 | 5 |
| APM capacity | 1600 | 1600 |
| APM Chargeable | Yes | Yes |
| APM authorisation | 1 | 1 |

**Note**

The MP2500 default charging parameters defaults are the identical to and FS3 configured with BIOS version 1.07 or later installed.

The APM capacity defaults to 1600mAh even after the battery type has been configured. Once NiMH batteries have been selected the battery capacity must also be manually configured.

## Conclusion

The FS/2 and FS3 batteries have each been specifically selected and they must NOT be exchanged. Exchanging FS/2 and FS3 batteries will result in unreliable performance. Charging an FS3 NiMH batteries in an FS/2 can result in damage to the FS/2. Itronix (UK) Ltd does not underwrite the performance of equipment not using approved batteries.

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